10 DAYS FOR WORLD DEVELOPMENT - TALK PRESENTED AT OTTAWA PUBLIC LIBRARY
THURSDAY 17 JANUARY 1977

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AT THE OUTSET, I SHOULD LIKE TO EXPRESS GRATIFICATION THAT THE FIVE CHRISTIAN CHURCHES ARE FOCUSSING THE TEN DAYS FOR WORLD DEVELOPMENT UPON FOOD AND IN PARTICULAR UPON THE FUTURE FOOD NEEDS OF THE LEAST PRIVILEGED COUNTRIES. AT THE SAME TIME, I AM SURE WE ALL RECOGNIZE THAT IT PRESENTS FOR ALL CONCERNED AND FOR US THIS EVENING A SUBJECT OF IMMENSE COMPLEXITY.

10 DAYS FOR WORLD DEVELOPMENT

WE ARE PRESENTED THIS EVENING WITH A SUBJECT OF IMMENSE COMPLEXITY. I ALMOST REGRET HAVING ACCEPTED PENNY SANGER'S KIND INVITATION: FOR WHAT CAN ONE SAY IN 20 MINUTES THAT WILL NOT SIMPLY ADD CONFUSION TO UNCERTAINTY.

RADHAKRISHAN WROTE THAT

> "WE ARE NOT THE HELPLESS TOOLS OF IMPERSONAL FORCES - WE CAN TAKE A HAND IN SHAPING THE FUTURE OF THINGS. THOSE WHO LIGHT A LITTLE CANDLE IN THE DARKNESS HELP TO MAKE THE WHOLE SKY AFLAME."

THE MOST WE CAN HOPE FOR THIS EVENING IS TO PROJECT A SMALL GLIMMER OF LIGHT THROUGH THE PRESENT TENEBROUS OBSCURITY OF DOUBT AND MISINFORMATION.

AT CLYDE SANGER'S SUGGESTION, I PROPOSE TO SPEAK MAINLY SOME WORDS OF GUARDED OPTIMISM RELATIVE TO THE CONTRIBUTION OF SCIENCE AND TECHNOLOGY TO WORLD AGRICULTURE. IN ADDITION, I SHALL ADDRESS SOME CAUTIONARY WORDS TO THOSE CONTEMPORARY SCHOLARS WHO I BELIEVE TEND TO OVERSIMPLIFY THE WORLD FOOD PROBLEM.

GOETHE DESCRIBED A MIRACLE AS FAITH'S DEAREST CHILD. SOMEONE COINED THE UNFORTUNATE WORD "MIRACLE GRAINS" FOR HIGH YIELDING VARIETIES OF WHEAT AND RICE, FROM WHICH TIME THEY BECOME FAVORITE WHIPPING BOYS RATHER THAN DEAREST CHILDREN.

THE IMPROVED VARIETIES WERE NOT MIRACLES NOR DID THEY PRODUCE A GREEN REVOLUTION. THEY WERE ESSENTIALLY THE LOGICAL EVOLUTIONARY OUTCOME OF SYSTEMATIC PLANT BREEDING RESEARCH; RESEARCH THAT IS NOW BEING APPLIED WITH TECHNOLOGICAL SUCCESS TO OTHER GRAINS INCLUDING MAIZE, SORGHUM, MILLET, ROOT CROPS, AND SEVERAL LEGUMES - CROPS THAT PROVIDE THE STAPLE DIET OF THE POOREST PEOPLE OF THE DEVELOPING COUNTRIES.

IT HAS BEEN SUGGESTED THAT THESE IMPROVED GRAINS HAVE SERVED ONLY TO MAKE THE RICH FARMER RICHER AND THE POOR FARMER POORER.

IN SOME DEGREE IT MAY BE TRUE THAT IT IS THE BEST TRAINED AND THEREFORE THE MOST SUCCESSFUL FARMERS WHO EXPLOIT IMPROVED TECHNOLOGIES FIRST.

IT IS ALSO THE MOST RESOURCEFUL, COMPETENT, AND INDUSTRIOUS THAT SURVIVE AND SUCCEED.

AS CANADIANS, WE SHOULD THANK GOD THAT IT WAS SUCH BRAVE AND ABLE EUROPEAN FARMERS AS THE MENNONITES WHO FIRST TURNED THE VIRGIN SOD IN MANITOBA. THEY HAD FARMED SUCCESSFULLY OVER MANY HUNDREDS OF YEARS IN THE NETHERLANDS, GERMANY AND RUSSIA.

IT IS A TRIBUTE TO THEIR SKILL AS AGRICULTURAL TECHNOLOGISTS THAT IN SPITE OF THE HAZARDS AND CONSTRAINTS OF AN UNFRIENDLY CLIMATE, WITHIN THREE YEARS MANY WERE PRODUCING GRAIN IN EXCESS OF THEIR OWN NEEDS, THUS LAYING THE FOUNDATION FOR CANADA'S FUTURE AS A MAJOR EXPORTER OF CEREALS.

BUT EVEN AMONG THESE ABLE FARMERS, SOME WERE CLEARLY BETTER THAN OTHERS. I HAVE SEEN IN CANADA, IN COLOMBIA, IN INDIA, IN THE PHILIPPINES, FARMERS WITH ALMOST IDENTICAL RESOURCES, SOME OF WHOM ARE CLEARLY MORE PRODUCTIVE THAN THE REST.

THE POINT I WISH TO MAKE IS THAT WITHIN AND AMONG AGRICULTURAL COMMUNITIES, SOME APPEAR BETTER ABLE, OR MORE WILLING TO ADAPT AND ADOPT NEW TECHNOLOGIES THAN OTHERS.

THE AVAILABLE RECORDS CLEARLY INDICATE A WIDE VARIATION AMONG REGIONS AND COUNTRIES IN THE RATE AND EXTENT TO WHICH THE NEW HIGH YIELDING VARIETIES WERE ADOPTED UP TO 1975. GENERALLY, FOR WHEAT, ADOPTION RATES IN NEPAL, INDIA, AND PAKISTAN, WERE MUCH HIGHER THAN AMONG MIDDLE EASTERN COUNTRIES.

IN ASIA, BY 1975 NEARLY 62% OF THE ASIAN WHEAT ACREAGE WAS UNDER HIGH YIELDING VARIETIES, AGAINST 26% FOR THE NEAR EAST.

IN THE CASE OF RICE, THE PHILIPPINES LEADS WITH ABOUT 64% OF THE RICE ACREAGE BEING UNDER HIGH YIELDING VARIETIES.

AS A DIRECT RESULT OF THE HIGH ADOPTION RATE OF THE HIGH YIELDING VARIETIES, RICE PRODUCTION IN THE PHILIPPINES HAS INCREASED BY MORE THAN 50% DURING THE PAST 10 YEARS.

WHAT IS BEING ACHIEVED IS NOT ONLY HIGHER YIELDS IN TONS OF GRAIN PER UNIT AREA, BUT HIGHER PRODUCTIVITY EXPRESSED AS TON PER HECTARE PER YEAR.

MANY OF THE NEW RICE VARIETIES MATURE MUCH FASTER THAN THE TRADITIONAL VARIETIES. CONSEQUENTLY, FARMERS CAN GROW MORE THAN ONE CROP ON THE SAME LAND IN THE SAME YEAR.

NOT ONLY DOES EACH CROP GROWN PRODUCE MORE RICE, BUT TWO OR THREE CROPS ARE GROWN EACH YEAR.

I DO WISH TO DISPEL THE BELIEF THAT IT IS ONLY THE WEALTHY FARMERS WHO BENEFIT FROM THE NEW RICE TECHNOLOGIES. I CAN ASSURE YOU, HAVING VISITED SEVERAL FARMING COMMUNITIES IN ASIA, MOST RECENTLY IN THE PHILIPPINES TWO WEEKS AGO, THAT I HAVE SEEN THE NEW VARIETIES GROWING ON MANY FARMS LESS THAN TWO ACRES IN TOTAL SIZE.

IDRC IN GENERAL, AND THE AGRICULTURE, FOOD AND NUTRITION SCIENCES DIVISION IN PARTICULAR, GIVES GREATEST EMPHASIS TO IMPROVING THE WELLFARE OF THE SMALL FARMER, THE ARTISANAL FISHERMEN, SMALL SCALE INDUSTRIES, AND RURAL FAMILIES, PARTICULARLY RURAL WOMEN. THE WORK OF RURAL WOMEN BOTH IN THE HOME AND ON THEIR FARMS IS OFTEN UNDER-ESTIMATED AND SOMETIMES OVERLOOKED.

IT IS IDRC'S PURPOSE TO ENCOURAGE AND SUPPORT APPLIED RESEARCH - RESEARCH CARRIED OUT BY AFRICAN, ASIAN, MIDDLE EASTERN, AND LATIN AMERICAN SCIENTISTS AND TECHNOLOGISTS FOR THE BENEFIT OF THEIR RURAL COMMUNITIES.

THE QUESTION WE ASK OF EVERY PROJECT PROPOSED IS WHOM IS THE RESEARCH INTENDED TO BENEFIT, AND HOW IS THE BENEFIT TO BE DELIVERED.

HOW APPLIED RESEARCH IS DIRECTED TOWARD HUMAN BENEFIT, IN PARTICULAR TO THOSE IN POOR RURAL COMMUNITIES, CAN BEST BE ILLUSTRATED BY A BRIEF DESCRIPTION OF SOME OF THE PROJECTS WE SUPPORT.

MULTIPLE CROPPING

THIS IS A PROCESS OF GROWING MORE THAN ONE CROP ON THE SAME LAND IN THE SAME YEAR. THIS COULD BE:

1) TWO OR MORE RICE CROPS;

2) RICE, FOLLOWED BY A DIFFERENT CROP (i.e. RICE IN THE WET SEASON - WHEAT, SORGHUM OR LEGUME IN THE DRY;

3) SEVERAL DIFFERENT CROPS GROWN TOGETHER - ROW INTERCROPPING
CORN, PEANUTS
SORGHUM, COWPEAS

SUCH A PROCESS HAS PROVED TO PROVIDE SEVERAL UNEXPECTED ADVANTAGES:

(A) CARNIVOROUS SPIDERS AND EARWIGS ARE FOUND ON PEANUTS AND THEY ATTACK INSECTS WHICH WOULD OTHERWISE DESTROY THE CROP;

(B) LEAFY LEGUMES SHADE OUT AND REDUCE THE NUMBER OF WEEDS;

(C) LEGUMES FIX NITROGEN FROM THE AIR AND IMPROVE THE FERTILITY OF THE SOIL.

AGRO-FORESTRY

AT THE UNIVERSITY OF THE PHILIPPINES IN LOS BANOS CROP VARIETIES THAT GROW WELL IN SHADE: PERMIT CROPPING IN COCONUT GROVES WHERE LEAFY COCONUT PALMS TEND TO SHADE OUT MOST FOOD CROPS.

IN ROW INTERCROPPING OF MAIZE AND LEUCAENA (A LEGUMINOUS TREE) THE LEUCAENA ADDS NITROGEN TO THE SOIL.

MAIZE YIELDS EQUAL TO MONOCROP WITH MAXIMUM FERTILIZER

SHIFTING CULTIVATION

1) CUT DOWN ESTABLISHED TREES;

2) BURN THE BUSH;

3) GROW CROPS FOR TWO OR THREE YEARS UNTIL SOIL IS EXHAUSTED;

4) LEAVE FALLOW FOR 8-15 YEARS AND ALLOW NATURAL BUSH AND WEEDS TO TAKE OVER.

IN NIGERIA, GHANA, AND THE CAMEROONS, A SERIES OF INTERLINKED PROJECTS TO REPLACE BUSH FALLOW WITH FAST GROWING USEFUL TREES, MANY OF THEM LEGUMES, THAT BOTH RAPIDLY RESTORE THE FERTILITY OF THE SOIL AND PROVIDE THE RURAL COMMUNITIES WITH WOOD FOR POLES, BUILDING MATERIALS, FIREWOOD AND CHARCOAL ARE IN PROGRESS.

MENTIONED LEUCAENA

IN ADDITION TO BEING RAPID GROWING, IT IS A GOOD SOURCE OF HIGH DENSITY CHARCOAL, ITS LEAVES CAN BE CUT AND FED AS GREEN FODDER TO ANIMALS.

WHEN GROWN INTERCROPPED WITH CORN, LEUCAENA CAN YIELD ABOUT FOUR TONS OF CRUDE PROTEIN PER HECTARE: MORE THAN DOUBLE THE PROTEIN YIELD OF A HECTARE OF SOYBEANS.

TO EMPHASIZE THAT THE APPLIED RESEARCH WE SUPPORT IS FOR THE BENEFIT OF SMALL HOLDERS AND THE POOR RURAL COMMUNITIES, MOST OF THE RESEARCH IN MULTIPLE CROPPING, OTHER CROPS RESEARCH, FORESTRY AND AGRO-FORESTRY IS CARRIED OUT WITH FARMER COOPERATION AND IN THE FARMERS' FIELDS.

THE UNIVERSITY OF THE PHLIPPINES AND THE INTERNATIONAL RICE RESEARCH INSTITUTE COOPERATIVELY DEVELOPED A RANGE OF ALTERNATIVE MULTIPLE CROPPING SYSTEMS THAT ARE THEN DEMONSTRATED TO AND CARRIED OUT BY FARMERS IN THEIR OWN FIELDS.

THE INVOLVEMENT OF THE INTENDED BENEFICIARY AT THE EARLIEST POSSIBLE TIME IS ESSENTIAL IF AGRICULTURAL RESEARCH IS TO SATISFY HUMAN NEED.

IN THE MULTIPLE CROPPING PROJECT AT THE UNIVERSITY OF THE PHILIPPINES, YOUNG SCIENTISTS ARE PLACED IN THE RURAL COMMUNITY UNTIL THE MORE PRODUCTIVE SYSTEMS ARE SUITABLY ADAPTED AND ADOPTED. AS FAR AS POSSIBLE, THESE RESIDENT ADVISERS ARE DRAWN FROM THE COMMUNITY THEY ARE SERVING AND ARE THEREFORE NOT STRANGERS TO THE LOCAL CULTURE, LANGUAGE AND PRACTICES.

BY VARYING THE RATIO OF ADVISERS TO COMMUNITIES, THE UNIVERSITY HAS STUDIED HOW MANY FARMING COMMUNITIES CAN BE ADEQUATELY SERVED BY A SINGLE RESIDENT ADVISER.
THERE WAS CLEAR EVIDENCE THAT WITH ONE ADVISER IN EACH COMMUNITY, THE ADOPTION BY SMALL FARMERS OF MORE PRODUCTIVE MULTIPLE CROPPING

WAS COMPARATIVELY RAPID AND WAS CONTINUED AFTER THE ADVISER WENT AWAY. IN AREAS WHERE THE RATIO WAS ONE ADVISER TO THREE OR MORE COMMUNITIES, THE SUCCESSFUL ADOPTION OF THE NEW TECHNOLOGIES WAS ALMOST INSIGNIFICANT. ALSO, IT WAS MANIFESTLY CLEAR THAT IN EVERY COMMUNITY SOME FARMERS ADOPTED THE HIGHER YIELDING SYSTEMS MORE SUCCESSFULY THAN OTHERS.

MAY I MENTION ANOTHER AREA OF RESEARCH WE ARE ENCOURAGING THAT GIVES PROMISE OF CONSIDERABLE BENEFIT. THAT IS AQUACULTURE, OR FISH FARMING.

AQUACULTURE IS AKIN TO ANIMAL HUSBANDRY: IT CONSISTS OF BREEDING AND RAISING FISH IN CAPTIVITY. IT CAN BE APPLIED TO SALT WATER, BRACKISH WATER AND TO FRESH WATER SPECIES.

AQUACULTURE INDIA

RESEARCH AT THE CENTRAL INLAND FISHERIES RESEARCH INSTITUTE IN POLYCULTURE HAS PRODUCED FIVE OR SIX DIFFERENT SPECIES OF CARP, EACH WITH DIFFERENT FEEDING HABITS, ALL IN THE SAME POND. THE RESEARCH APPEARED PROMISING ON A LABORATORY SCALE, BUT NEEDED TO BE TESTED UNDER REAL LIFE CONDITIONS. I SPENT THE FIRST WEEK OF JANUARY VISITING REMOTE VILLAGES IN ORISSA AND WEST BENGAL WHERE FOR THE PAST YEAR AND A HALF THE LABORATORY RESULTS HAVE BEEN PUT TO THE TEST OF REAL RURAL LIFE CONDITIONS.

THE PROCEDURE FOR THE TESTING WAS:

1) CLEARING THE POND OF UNWANTED FISH

- OILSEED RESIDUE TOXIC TO MOST AQUATIC LIFE BUT THE TOXIC SUBSTANCE IS BIODEGRADABLE AND DISAPPEARS AFTER TEN DAYS.

2) POND STOCKED WITH MIXTURE OF YOUNG FISH

3) FERTILIZED REGULARLY WITH COWDUNG AND PHOSPHATE FERTILIZER TO ENCOURAGE GROWTH OF ALGAE.

4) SOME FISH GRASS CARP FED ON VEGETABLE WASTE FROM SPECIAL FLOATING FEEDERS.

ONE TYPICAL VILLAGE WITH A ONE ACRE POND PRODUCED ABOUT THREE TONS OF FISH DURING THE FIRST YEAR.
BEFORE POLYCULTURE, THE INCOME FROM FISH WAS ABOUT 1,000 RUPEES ($125). DURING THE FIRST YEAR THE VALUE OF FISH HARVESTED WAS ABOUT 22,000 RUPEES, ($2,750)

AGAIN, AS WITH THE MULTIPLE CROPPING PROJECTS IN THE PHILIPPINES, THE SCIENTISTS HAVE MOVED OUT OF THEIR LABORATORIES AND EXPERIMENTAL STATIONS TO WHERE THEY CAN DEMONSTRATE AND GUIDE THE ADOPTION OF THE MORE PRODUCTIVE TECHNOLOGIES BY THE RURAL PEOPLE.
I COULD SITE MANY MORE EXAMPLES OF HOW LOCALLY DEVELOPED, MORE PRODUCTIVE TECHNOLOGIES ARE BRINGING BENEFIT TO RURAL PEOPLES.

POST-HARVEST

THE WOMEN OF THE FARMING COMMUNITIES IN WEST AFRICA SPEND AS MUCH AS FIVE HOURS A DAY GRINDING GRAIN BY HAND. A SURVEY BY AFRICAN SCIENTISTS AND HOME ECONOMISTS INDICATED THAT THE AFRICAN WOMEN'S GREATEST DESIRE WAS TO BE EMANCIPATED FROM THIS CHORE IN ORDER TO DEVOTE THE TIME TO MORE PRODUCTIVE ACTIVITIES SUCH AS GROWING VEGETABLES AND RAISING POULTRY.

IDRC HAS SUPPORTED RESEARCH IN SENEGAL AND NIGERIA THAT HAS DEVELOPED SEVERAL ALTERNATIVE SIMPLE MECHANICAL MILLING SYSTEMS THAT ARE NOW BEING TESTED BY RURAL COMMUNITIES.

THE SAME RURAL PEOPLE ARE ALSO EVALUATING NEW TECHNIQUES FOR DRYING GRAIN BY SUN AND WIND FOR THRESHING, STORING, AND USING MILLED GRAINS IN A VARIETY OF WAYS.

I AM NOT ATTEMPTING TO PROVE THAT TECHNOLOGICAL RESEARCH WILL ALONE ELIMINATE THE THREAT OF HUNGER AND ACUTE MALNUTRITION FROM ALL THE DEVELOPING COUNTRIES.

WHAT I AM PROPOSING IS THAT TECHNOLOGICAL RESEARCH MUST BE GUIDED BY THOSE WHO HAVE A KNOWLEDGE OF THE SYSTEM IN WHICH THE NEW OR IMPROVED TECHNOLOGY IS TO BE APPLIED, TOGETHER WITH AN INTIMATE FAMILIARITY WITH THOSE PEOPLE THE TECHNOLOGY IS INTENDED TO BENEFIT.

MAY I NOW BRIEFLY ENTER MY WORDS OF CAUTION.

I SENSE A CONSIDERABLE AND DANGEROUS TENDENCY TO OVERSIMPLIFY THE PROBLEM WE ARE DISCUSSING.

THAT THERE IS A POTENTIAL FOOD SHORTAGE LOOMING ON THE HORIZON IS WIDELY ACCEPTED: HOW TO PREVENT THE DEVASTATION THAT WIDESPREAD FOOD DEFICIENCIES COULD BEING ABOUT IS FAR FROM CLEAR.

SEVERAL RESPONSIBLE AND COMPETENT AGENCIES PREDICT A WORLD SHORTFALL IN CEREAL GRAINS OF BETWEEN 95 AND 110 MILLION TONS BY 1985.

A RECENT STATEMENT BY THE UNITED STATES DEPARTMENT OF AGRICULTURE SUGGESTS THAT THIS SHORTFALL COULD BE ELIMINATED BY THEIR GOVERNMENT BRINGING UNDER CULTIVATION ABOUT 110 MILLION ACRES OF AVAILABLE LAND.

HOWEVER, FILLING THE GAP FROM THE USA AND CANADA BY MEANS OF FOOD AID CAN ONLY BE REGARDED AS A TEMPORARY PALLIATIVE.

THE UNITED NATIONS, IN A RECENT PAPER, PREDICTS A RAPID RISE (MAYBE BY 60%) IN WORLD POPULATION BETWEEN 1975 AND THE YEAR 2000. THE AUTHORS GO ON TO SAY THAT THIS WILL CALL FOR A FIVE PERCENT ANNUAL GROWTH IN AGRICULTURAL PRODUCTION.

WHILE THIS INCREASED PRODUCTION AND THE ADEQUATE PROTECTION AND DISTRIBUTION OF THE PRODUCTS MAY NOT BE ACHIEVED BY APPLIED RESEARCH AND IMPROVED TECHNOLOGY ALONE, IT WILL NOT BE ACHIEVED WITHOUT MORE PRODUCTIVE AND EFFICIENT SYSTEMS OF PRODUCTION, PROTECTION, DISTRIBUTION AND UTILIZATION.

PERHAPS THE MOST DIFFICULT TASK WILL BE TO DELIVER THE NEW TECHNOLOGIES TO THE FARMERS, FISHERMEN, FORESTERS, FOOD PROCESSORS, AND RURAL HOUSEHOLDS WHO NEED TO ADOPT THEM. THIS INDEED WILL BE A FORMIDABLE TASK.